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Memoir on the Megatherium, and other extinct gigantic quadrupeds of the coast of Georgia, with observations on its geologic features. New York, 1846.

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MEMOIR

ON

THE MEGATHERIUM,

AND

OTHER EXTINCT GIGANTIC QUADRUPEDS

OF

THE COAST OF GEORGIA,

WITH OBSERVATIONS

ON

ITS GEOLOGIC FEATURES.

BY

WILLIAM B. HODGSON.

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PREFACE.

I HAD been honored by an invitation from the National Institute, established at Washington, to read a paper before that body, on some subject connected with the progress of science. Having accepted that invitation, I was placed in the position of the traveller who had requested an interview with Mohammed Ali, the Pacha of Egypt. The traveller, not having previously arranged a subject of conversation to be held with His Highness, was at fault, during his audience. "Say something!" was the Viceroy's indulgent suggestion. There was, however, a high administrative import in that suggestion.

The wonderful organic remains which crowd and underlie the recent formation of the coast of Georgia, seemed to me a proper subject for this occasion, as one about which something might be said.

Residing at Savannah, in the midst of this fossil region, so attractive to geologists, my curiosity had naturally been directed to the subject. But, whilst

I might feel a general interest in the diffusion of knowledge, this required a special science, to which my pursuits had not led. Nor did my Cabinet possess the materials upon which such science is based. The phenomena of nature, demand careful and personal observation. I could not forget the *faux pas* of the learned Dr. Mitchell of New York, in his "observations on the geology of North America, appended to Cuvier's theory of the earth." "It seems now to be understood," he says, "that the level of the Sea of Marmora and of the Euxine, is so nearly the same, that the current sometimes runs through the Bosphorus, to replenish the Euxine, and then again to evacuate it." This singular conception is repeated in Sir Walter Scott's Count Robert of Paris, in which the returning tide is represented to have drifted the Crusaders' fleet up the Bosphorus. I shall not undertake to say that such alternation of current never did occur; but certainly, during a long residence on the Bosphorus, I found the hydrography of Othello to be correct:—

> "Like to the Pontic sea,
> Whose icy current and compulsive course
> N'er feels retiring ebb, but keeps due on
> To the Propontic and the Hellespont."

My own deficiency of information regarding the fossil remains of Georgia, has been supplied by the obliging courtesy of others. Dr. I. C. Habersham of Savannah, who has long been known as a zealous

collector, kindly favored me with the accompanying memorandum. He also sent by me, to the National Institute, several important bones of the Megatherium, which are now deposited in the Museum of that body. Those of the skull and astragalus were deemed so valuable, that the annexed drawings of them were made by an artist, under my direction. The ungual phalanx, still remains in his possession.

For the geographic chart of the geologic localities, I am indebted to Mr. Adams.

After I had prepared my paper from the materials to which I then had access, I was obligingly favored by J. Hamilton Couper, Esq., of Hopeton by Darien, with his observations on the geology of the sea-coast of Georgia, which are so full and completely scientific, that my own remarks might well have been suppressed. A synopsis of these observations was some time ago published in the London and Edinburg philosophical journal; but their importance and value to science, now require them to be published in extenso, together with his map of geologic sections. This permission is yielded to my earnest request. The civic virtues of Mr. Couper, are not less universally admired, than his devotion to science. *Moribus ornat et emendat.*

The printing of this paper, was prompted by a recent visit to Savannah of Mr. Lyell, the eminent geologist, of London. In a conversation with that illustrious votary of science, he did me the honor to

ask, what had become of my manuscript. It is now printed in reply, and with the view, by private distribution, of suggesting a detailed and comprehensive geologic survey of the state of Georgia. Such a survey would develope her unrivalled mineral resources, and largely contribute to the science of palæontology.

FOSSIL REMAINS.

THE geologic strata of this globe, and the organic remains which they envelope, are the enduring records of its antiquity. They are the medals and the vestiges of creation, by which its pre-human history is read, and which attest the rise and fall of animal Kingdoms, before the existence of man. Not obeliscal hieroglyphs, etruscan tablets, or parian chronicles, are more legible or more authentic, than these inscriptions upon nature's monuments.

The wide diffusion of fossil remains of the Mastodon and Mammoth, in North America, has contributed largely, to the progress of palæontology and geologic science. The existence of these fossil mammalia, was discovered a century ago, in the valley of the Ohio. More recently, another genus of extinct mammals was discovered, and which being first described by Mr. Jefferson, received from him the name of Megalonyx. Within the last twenty years, fossil bones of another gigantic quadruped have been discovered, along the sea-coast of Georgia, which by comparison with the skeleton of the same animal preserved at Madrid, has been found to be the

Megatherium. The investigations of science have proved it to be a congener of the Megalonyx, but of more wonderful size and construction. They both belong to the family of Gravigrades or Sloths.

The scientific investigations, the discovery and localities of these singular quadrupeds, must be interesting to general curiosity, and may be useful to the geologist. In the language of Mr. Owen's elaborate memoir on the *Mylodon robustus*, a gigantic Sloth, "the indications of an extensive family of most singular quadrupeds, once spread over the American Continents, from the latitude of New York to Patagonia, cannot, it is presumed, be pondered on without exciting the strongest interest, and desire to obtain further and more definite insight into their habits, their natural affinities, and the business assigned to them in the organic economy of a former world."

ORIGIN AND PROGRESS OF DISCOVERY.

THE first notice, ex *Cathedrâ*, of the fossil bones discovered near Savannah, was made by Dr. Samuel L. Mitchel, in a paper published in the annals of the Lyceum of natural history at New York. It was read, Nov. 17, 1823. He had, for the subject of his investigation and comparison, but one tooth and a part of another. These he did not hesitate to assign to the Megatherium of Cuvier. He remarked, "I can obtain no information as to their situation when discovered."

This information, however, was furnished, in the month of April of the same year, by an editorial article of the "Georgian" newspaper, published at Savannah, which anticipated, by several months, the announcement of Dr. Mitchell. The following extracts from that article, will, in part, supply this want of information, which was also a subject of regret to subsequent investigators whose papers will be noticed.

"These bones were found on Skiddaway island, in a cove between the plantations of Mr. Stark and Mr. Goodwin. They were partly exposed above the

surface, and partly imbedded in blue clay and sand, and were covered by water at high tide, and exposed at low. The surface of the island is about twelve feet above the place where the bones were found; the soil appearing to have been washed away, until they were uncovered. They occupied an extent of surface of sixteen yards."

"The negroes on the plantations in the vicinity, recollect to have seen them, twenty years ago, and described them to have been, at that time, quite entire; so much so as to project sufficiently to form a remarkable object, from a boat passing on the river. Mr. Stark first observed them a year ago, and collected a part of the lower jaw-bone, fragments of two heads of the thigh-bone, a fragment of a large bone supposed to be the tibia, and some other fragments less remarkable."

"Mr. Stark having been kind enough to point out the locality to Drs. Habersham and Scriven, they were enabled to find a number of bones very interesting. Those which they brought to Savannah consist of a lower jaw, broken, but easily put together, so as to show, perfectly, its form. The grinding teeth of this bone are perfectly preserved, and are four in number, on each side. They resemble two incisor teeth, applied to each other by their shortest side. There were also found, a fragment of the upper jaw, with one or two teeth; three perfect vertebræ of the neck; several fragments of ribs; a spinous process of one of the dorsal vertebræ; the upper end of the tibia, with the articulating surface; one of the tarsal bones; two fragments of the thigh bone, and many others."

"The size of these bones leads to the belief, that they are the remains of the *Mammoth.* Two lower jaw-bones were found. This circumstance, together with the extent of ground they occupied, the similarity of the forms of the bones and the teeth, render it certain that they are the remains of two animals of the same species."

This is the information furnished by the editoral article. These fossil bones were found, by the comparisons of Dr. Mitchell and Mr. Wm. Cooper, to belong not to the pachyderm order of animals, like the mammoth, but to the unguiculate, like the megalonyx or the sloth. Thus it became known for the first time, that the fossil megatherium existed in North America, as well as in the corresponding latitudes of the southern hemisphere. A more particular notice of this locality, now called *Fossilossa*, will be made from my personal observation. The remains of three distinct individuals have been found, along a line of a mile, on the bank of Skiddaway island; a fourth has been discovered by James Hamilton Couper, Esq., near Darien, and the remains of a fifth, it is believed, exist on one of the sea-islands. It is represented to have been denuded, by the gradual erosion of tidal currents.

On the 19th of April 1824, Mr. William Cooper, of New York, read a paper before the Lyceum of Natural History, "on the remains of the megatherium recently discovered in Georgia." He enumerates and describes more than twenty different bones of this fossil quadruped. But among them there was no one of the three principal bones of the skeleton, the *skull*, *astragalus*, and *great claw*, the drawings of

which are now presented. In this paper, Mr. Cooper remarks that "it is extremely probable all the relics of the megatherium yet discovered in North America, have belonged to a single individual."

In July 1827, Mr. Cooper read a second paper, on the same subject, acknowledging his obligations to Dr. Habersham, for other parts of the skeleton of the same animal, consisting of fragments of the large bones of the extremities. Still, he had not obtained any one of the three bones now presented.

Contemporaneously with the discovery of these Megatherium fossils on Skiddaway island, was that of bones belonging to the *Mastodon giganteum*. These were found at a point on Vernon river, called Hainer's bridge, about seven miles from Savannah, as will be found indicated on the accompanying map. The weight of the tusk of this proboscidian maminal, was 56½ pounds; the length 3 feet 3 inches, and the widest circumference 33 inches. Of this animal, a femur was procured, and sent to Monsieur Brogniart, at Paris. Some remains of a cetaceous mammal were also discovered near Ebenezer, on the Savannah river, and distant from this town about eighteen miles.

Until the publication of Dr. Goodman's Natural History of America, in 1831, the papers of the New York Lyceum, first cited, contained all the information accessible, relative to the existence and discovery of the megatherium in Georgia. He does not seem to have been aware of the co-existence of the mastodon; for in his synopsis of localities where the fossil bones of this animal have been found in North America, he has not noticed the deposits of Georgia.

Many different bones have been sent to various scientific bodies in the United States, from these deposits. But, I am not aware of any other notice that has been made of them, excepting that contained in a letter from Dr. J. P. Scriven of Savannah, recently addressed to the National Institute, and accompanying the transmission of a well preserved maxillary bone, with its insertions.

The most important discovery of fossil bones, along the sea-coast of Georgia, remains now to be noticed. It is due to James Hamilton Couper, Esq., of Hopeton by Darien.

A canal was cut a few years ago, from Brunswick on the Turtle river, to the waters of the Alatamaha. Near this line Mr. Couper resides. This section of the surface brought to light an extraordinary group of fossil bones, which he collected.

They have been described by him, in a paper read before the geologic society of London, on the 1st of February of the last year. A synopsis of that paper may be thus stated :—Among the fossil bones discovered by Mr. Couper, are remains of the megatherium, mastodon giganteum, mammoth, hippopotamus and the horse. To these may be added, remains of a fossil *sus*, and a *Chelonia*, as described by Dr. Harlan of Philadelphia, in Silliman's Journal, (Vol. xliii.) from the same deposit, and procured by Mr. Couper. The fossil bones discovered by him were found resting on the yellow sand, and enveloped in the recent clay alluvium. For twenty miles, inland from the canal, the land is low, of an average height of fifteen feet, reaching in some instances to forty feet, and consisting of swamps, salt-marshes, sandy land, and

clay loam. The whole of this district is a post-tertiary formation, and is composed of alluvium and a well characterized marine, post-pliocene deposit. These geologic features equally apply to the district surrounding the Skiddaway deposit.

The inferences to be deduced from these facts are, that the surface of the country has undergone no violent change since those extinct genera of animals inhabited it. The absence of all deluvial action, upon the enveloping alluvium, establishes this inference. Mr. Couper has also shown, that the fossil marine shells found in this deposit, are the analogues of those now existing, in the neighboring sea. The inference from this fact is, that if any change of temperature has taken place, on the earth's surface, fatal to these mammalia, the temperature of the ocean, at a period prior to the existence of the megatherium, mastodon, bison and hippopotamus, was suitable to the marine testacea of Georgia, existing at this day.

This memoir of Mr. Couper supplies all the scientific data, which, until now, have been wanting, in relation to the fossil deposit of Skiddaway. The Brunswick deposit is distant from Savannah, south-by-west forty-five miles, and nearly equi-distant with the former from the ocean, and in a district of analogous formation.

The preceding narrative is believed to embrace, whatever has heretofore been published, on the organic mammal remains of Georgia.

The geographic distribution of species, is a problem in geology which seems to demand, in this relation, a statement of the discoveries heretofore made, of megatherioid remains in South America.

In the year 1789, the Marquis of Loretto, then Viceroy of Buenos Ayres, sent from that country to Madrid, the first and the most perfect skeleton of the megatherium now existing. It was found on the river Luxan, at a distance of nine miles, west-south-west from the town of Buenos Ayres, in a sandy soil, and one hundred feet below the surface. Another specimen was sent to Madrid, from Lima, in 1795, and a third was discovered in Paraguay, in the year 1832. Many parts of another skeleton were taken to England, in 1841, by Sir Woodbine Parish, lately H. B. M. Chargé d'affaires, near the Argentine Republic. It was found in the bed of the river Salado, near Buenos Ayres. These remains have been described by Mr. Clift. The zealous researches of this distinguished diplomate, subsequently discovered the fossils of two other megatheres; and such has been the success of enterprising naturalists, that Mr. Owen has noticed the recovery, from that region, of the remains of twelve individuals. Mr. Lyell states, on the authority of Mr. Darwin, the existence of the megathere in Patagonia, and of its co-existence in that station, with the megalonyx, mylodon and horse.

I will here incorporate in the text of this paper, some facts in relation to these mammals, which have recently occured.

To establish the true character of the horse, whose remains were found by Mr. Couper, the Academy of Natural sciences at Philadelphia, lately placed in the hands of Mr. Lyell, the teeth of that quadruped, which Mr. Couper had sent to the Academy. They will be scientifically analysed and compared, by the eminent palæontologist Mr. Owen, of London. It will

thus be known, in what the American equus of a former world differs from our contemporary, which was introduced to this continent by European conquest.

Further discoveries of megatherioid quadrupeds in the alluvial region of our Atlantic coast, were announced in the month of August of this year. At a meeting of American geologists, held at that time in New York, Dr. Dickerson of Mississippi, announced that he had found bones, both of the megatherium and megalonyx, near Natchez in that state. An examination of these fossils leaves no doubt of the fact. At the next annual meeting, it will be established by additional proofs. The discovery of a human fossil bone in the same locality, as announced by Dr. Dickerson, is so curious and novel a phenomenon, and conflicts so much with our received chronology of the race of man on this globe, that the presumed fact is merely alluded to now, in anticipation of future developments.

These are all the notices which I have been able to collect, of the discoveries of these mammals. Our knowledge, thus far, restricts the habitat of the megatherium in North America, to the parallels of 31 and 33 degrees. A corresponding line, south of the tropics, would seem to have been its station in the other hemisphere. Lima and Patagonia, are however, beyond this belt, and this question in palæontologic geography may not be decided by our present data. There is doubtless a law of climatology which governs the development of genera and species. Humboldt, in his "personal narrative," says, "we cannot explain why no family of melastomas vege-

tates north of the parallel of thirty degrees; or why, no rose-tree belongs to the southern hemisphere. Analogy of climate is often found in the two Continents, without identity of productions." In regard to animals, changes in physical conditions, and migrations, may govern the duration and limit of groups of species, and their geographic distribution.

It has been suggested by Mr. E. W. Brayley, in the September No. 1843, of the London philosophical magazine, that one of the fossil bones brought from Eschscholtz bay, from a high latitude in Russian America, belonged to a species of megatherium. This bone is a cervical vertebra. It was included in a series of specimens selected from the Eschscholtz bay fossils, for the British Museum, and brought to England by Captain Beechey, from a voyage of discovery, in H. M. S. Blossom. He says that, in this high latitude, fossils of the mammoth, horse and urus, co-exist; and that if this cervical vertebra should really be found to have been brought from that locality, a parallel case with that of Georgia would be furnished, in which state is presented the phenomenon of the co-existence of the "megatherium, mastodon, mammoth, horse, bison and hippopotamus." As the fact in this suggestion, has not been noticed by Dr. Buckland, Mr. Clift, or by Mr. Owen, in his elaborate work on the *Mylodon robustus*, the existence of the megatherium, north of 33 degrees, in this hemisphere, may well be doubted, in the present state of science.

THE GEOGRAPHY

AND

GEOLOGIC FEATURES OF THE FOSSIL REGION

A CHAIN of sea-islands and marshes, extending along the Atlantic shore of Georgia, characterizes its coast. This peculiar feature marks the Atlantic coast of the United States, from the Chesapeake bay to the Mississippi. Along the coast of Georgia, the principal islands are ;—Wilmington, Whitemarsh, Skiddaway, Ossabaw, St. Catherine's, Sapello, St. Simon's, Jekyl, Cumberland and Amelia. This oceanic chain of islands is comprised within a belt of twelve miles wide, from the sea to the main land. The links of this chain may be represented by rivers, creeks and inlets, flowing into the sea, and separating the islands. The inlets of the sea, called sounds, betwixt the main land and the islands, afford a secure navigation, for vessels of one hundred tons burthen. The islands are made up of hammock land and salt-marsh, abounding in barilla, sedge and rushes. The salt-marsh lies on the west and inland side of the islands. The eastern or sea-side is a clear, hard, sandy beach, interspersed with marine exuviæ. The hammock or high land, produces that species of gossypium, called long staple, or sea-island cotton.

If this chain of sea-islands indicate an advance of the continent upon the sea, observation has afforded no proofs of the supposition. The reverse of this conjecture may be assumed, from the geologic phenomena presented by the salt and tide-water marshes. They are now inundated by every tide, whilst, in former ages, they undoubtedly were firm land, and covered with forests of cypress, oak, magnolia, tupelo and other trees, of precisely the same kind as the forest trees which now cover the river swamps, several feet above the highest tides. This fact is one of daily observation by our planters, who discover submerged and imbedded strata of the stumps of these trees, at a distance of four feet below the soil of tide marshes. This phenomenon indicates two elevations of land, and one depression or submersion. The fate of the quadrupeds, whose fossils abound in this alluvial, post pliocene stratum, may be connected with these geologic changes. It is certain, however, that the absence of all traces of diluvial action, in this region, proves, that no violent or sudden change of the condition of this district has occured, since it was inhabited by these mammals of extinct genera.

On the shore of the main land, along a margin of a few miles in breadth, the same features of salt-marsh and hammock land, occur. Here commences a level, unbroken plain of pine barren land, extending fifty or sixty miles into the interior. This plain is interspersed with fresh-water swamps, and along the courses of the rivers and creeks there are extensive tide-water swamps.

This wide level of sandy soil, lying upon a substratum of ashy clay, attains an average elevation of

twenty feet above tide water, and sometimes reaches forty feet. Similar geologic features probably mark the whole Atlantic coast, northward to Virginia, through North and South Carolina, and presenting a parallel line with the coast.

In the state of Georgia, the interior boundary line of this level plain, would run through the counties of Scriven, Bryan and Liberty, to Camden. Proceeding westwardly from the coast, the country rises gradually, by well defined steps or elevations.

1. The pine barren, of light sandy soil, already mentioned, extending sixty miles into the interior.

2. A Ridge of sand hills, attaining an average height of 250 feet above the level of the sea. This elevation is reached by a gradual ascent from the first level. The soil of this second level, is a sandy loam, from nine to twelve inches deep, overlying a stratum of yellowish clay. It produces oak and hickory, interspersed with pines. These sand-hills may have been an earlier coast of the ocean.

3 At the distance of fifty or sixty miles from the sand-hills, is found another ridge, more abrupt in its elevation, and continuous for fifteen miles, when a third plain is reached. Beyond this commences the hilly, broken country, extending back to the foot of the Appalachian mountains. The soil of this level is mixed with particles of clay and gravel, of a brownish color, and is imposed upon a stratum of adhesive, reddish clay. The tertiary strata gradually decline from this point, towards the ocean, where the newer formations succeed, imbedding marine shells of existing species.

On the second level, and towards its western boun-

dary, at the distance of one hundred miles from Savannah, occurs a remarkable deposit of testaceous and radiate fossils. It commences on the Savannah river, at a point called "Shell bluff," and runs south-westwardly through the state of Georgia, and parallel with the ocean coast, to the Tombigbee river, in the state of Alabama. The ridge, where this deposit abuts on the river, is seventy feet higher than the stream. To the depth of thirty feet, this bed is composed of shells of the ostrea, of extraordinary size, measuring twenty inches in length, and eigth in width. It lies upon a stratum of yellowish, sandy mould, of some feet deep. This again rests upon a bed of marl, or testaceous concrete. In the county of Washington, this ridge presents abundant stelleridan and crustacean fossils. Such remains constitute a large portion of extensive ranges of mountains, as the secondary strata of the Alps and Pyrenees. Such too, is the constitution of the limestone of some of the pyramids, which abounds in nummulites. Further investigation of these crustacean deposits, may contribute much to palæontologic geography.

This comprehensive view of the geology of Georgia and of the Atlantic coast, has relation to a more detailed account of the region of fossil mammalia.

That point of the island of Skiddaway, where fossil remains have been found, and now called *Fossil-ossa*, is distant twelve miles, south-south-west, from Savannah. Hainer's bridge, the deposit of mastodon remains, is seven miles, and Vernonburg, where an immense bed of marine fossil shells exists, is nine miles from this town.

The localities of the Skiddaway deposit, present

some singular features. The average elevation of firm land, in the adjacent country, and on the island itself, may be seven feet above the level of ordinary neap tide. The ebb and flow of the ocean tides, are constantly and rapidly changing the banks of the firm land and marshes, through which it makes tortuous channels. As the tidal current sets with force, against an opposing bank, a salt-marsh invariably advances with equal pace, from the opposite shore. Islands of considerable extent, and covered with trees, have, within a few years, been entirely washed away. This incessant progress of detrition and accumulation, has been marked by observing planters, and estimated at three feet every year. Such are the laws of mutation, now in action, at the Skiddaway deposit.

The fossil bones found here in 1823 and 1842, were all discovered in the bank, in a line of a half mile in extent. At this point the inlet, or river, as it is called, makes a sharp bend, and forces the tide into a current of increased rapidity. The erosion of the bank by this tidal current, has gradually exposed the imbedded bones. These were denuded at low tide, and again covered at high water. The long tongue of salt-marsh opposite to this bend, as described in the map, and marked A, has pushed its accumulation towards the retreating bank of the other side. Thus the bones which now lie in the channel of the river, will, doubtless, in a few years, be again imbedded under salt-marsh, to be again exposed, perhaps, by other physical changes. The currents at Skiddaway, after having exposed these mammalian remains, is not sufficiently strong to remove them. They remain in situ, to be imbedded by subaqueous formation.

These geologic changes of destruction and reproduction,—this palingenesia,—may explain some of the phenomena of tide-swamps, and their imbedded strata of tree-stumps, heretofore mentioned. I have no theory to defend, and therefore I present the subject in this connexion. The strata of stumps, if standing erect, can scarcely be explained by the aqueous causes now in action; unless the former level, invaded by the tide, and now submerged, were but slightly elevated above tide-water. The effect of the tide's erosion, upon trees or stumps now standing above tide-level, is to *overthrow* and entomb them. How they can be left upright, requires the hypothesis of a depression or change of level.

This recent post-pliocene formation, in the states of North and South Carolina, contains fossil remains of all the mammalia found in Georgia, excepting the megatherium, and probably the megaloynx, which there is reason to suppose. Mr. Owen, in his recent elaborate work on the *Mylodon robustus*, has profoundly investigated the characteristics and habits of megatherioid quadrupeds, and in the conclusion of this paper the result of that investigation may properly be presented.

"In fine, whatever be the value of such collateral evidence as may be deduced from the known conditions of the vegetable kingdom, a searching and impartial review of the anatomical facts and analogies, detailed in this memoir, has led me to the conclusion, that:—all the characteristics which co-exist in the skeleton of the mylodon and megatherium, conduce and concur to the production of the forces requisite for *uprooting and prostrating trees.* The megatheri-

ans constituted an extensive tribe of leaf-devouring and tree-destroying animals, of which the larger extinct species were rendered equal to the herculean labors assigned to them in the economy of an ancient world. In the task of thinning the American forests, the brute force of the mylodon (and megatherium,) has been superseded by the axe of the backwoodsman."

The megatherium, which lived by uprooting trees and devouring the leaves, was a terrestrial mammal, of gigantic proportions. Its body was twelve feet long, and eight high; its haunches were more than five feet wide; its feet were a yard in length, and terminated by terrific claws. The figurative description of Job's behemoth may be transferred to our beast. "Lo now! his strength is in his loins, and his force is in the navel of his belly. He moveth his tail like a cedar; the sinews of his stones are wrapped together. His bones are as strong pieces of brass; his bones are like bars of iron. He is the chief of the ways of God."

> "The earth obey'd, and straight
> Op'ning her fertile womb, teem'd at a birth
> Innumerous living creatures.
> * * * * scarce from his mould
> Behemoth, biggest born of earth, upheaved
> His vastness."
>
> MILTON. Lib. vii. 470.

MEMORANDUM,

BY DR. JOSEPH HABERSHAM OF SAVANNAH, OF THE MOST IMPORTANT FOSSIL BONES AND SHELLS, NOW IN HIS POSSESSION, WHICH WERE DISCOVERED IN THE YEAR 1842, ON THE ISLAND OF SKIDDAWAY, ON THE SEA-COAST OF GEORGIA. IN THE DESCRIPTION AND MEASUREMENTS, HE WAS ASSISTED BY THE KINDNESS OF JAMES H. COUPER. ESQ.

A. MEGATHERIUM CUVIERI.

No. 1.* The upper part of the skull. The lateral and superior portions in a good state of preservation. The zygomatic arches and depending, tongue-like process, are perfect; as are also the auditory holes. The upper maxillary bones are wanting.

Dimensions.—The transverse diameter of the skull, at the meatus auditorius, $10\frac{3}{10}$ inches; ditto, at the extremities of the zygomatic processes, $14\frac{5}{10}$ inches. Diameter of the auditory holes, $\frac{9}{10}$ of an inch. The zygomatic processes, $5\frac{8}{10}$ inches long; 2 inches wide; $\frac{7}{10}$ of an inch thick.

* Vide plate I.

No. 2. A fragment of the posterior lateral part of another skull, containing the auditory hole and posterior extremity of the zygomatic arch.

No. 3. Six large molar teeth, all well characterized, but none entirely perfect, some wanting the crown, and others, the lower extremities.

1.	greatest	diameter	$1\frac{8}{10}$	inches.	$1\frac{6}{10}$	least	diameter.
2.	"	"	$1\frac{7}{10}$	"	$1\frac{6}{10}$	"	"
3.	"	"	$1\frac{7}{10}$	"	$1\frac{5}{10}$	"	"
4.	"	"	$1\frac{7}{10}$	"	$1\frac{5}{10}$	"	"
5.	"	"	$1\frac{6}{10}$	"	$1\frac{4}{10}$	"	"
6.	"	"	$1\frac{4}{10}$	"	$1\frac{3}{10}$	"	"

average length if restored, 6 to 7 inches; weight of No. 1, 246 pennyweights.

No. 4. One small, dwarfed tooth, with a portion of the maxillary bone. The crown imperfect; but as it is *in situ*, the length can be ascertained. This is a well characterzied tooth of the megatherium, but from its diminutive size, it might be supposed to belong to a smaller species, or a young animal, were it not that the adjoining alveolar cavity indicates that the next tooth was of the usual size.

No. 5. A portion of the left lower maxilla, with the fragment of a tooth.

No. 6. Several dorsal vertebræ; one with a process, $7\frac{1}{2}$ inches long.

No. 7. Several fragments of the ribs and pelvis, all imperfect.

No. 8. A head of the femur; diameter, seven inches.

No. 9. A lower extremity of the femur.
Greatest diameter across the condyles, 11 inches
Least diameter do. do. 5 do.
Diameter across the processes 14 do.

No. 10. Two heads of the humerus.
Diameter at the processes 8 inches
Diameter of the condyle 5½ inches

No. 11. Two lower extremities of the humerus, with the condyles perfect.
Diameter at the processes 14 inches
do. across the condyles 7¾ do.
There is no foramen.

No. 12. The upper extremity of a tibia
Diameter 8 and 6½ inches.

No. 13. Lower extremity of a tibia.
Diameter at the articulating surface 12 inches
Greatest diameter at the shank $4\frac{8}{10}$ do.
Least do. do. 3 do.

No. 14. A metacarpal bone.
Length 9 inches,
Diameter of the anterior extremity, $4\frac{5}{10}$ inches
do. do. posterior do. $3\frac{7}{10}$ do.
do. at the middle $2\frac{3}{10}$ do.

No. 15. An os calcis; the articulating extremities perfect, and the other broken.

Length 9½ inches

Depth at the middle 4 inches.

No. 16. Two fragments of the convex portion of the phalanges. These fragments are too imperfect to lead to any conclusion whether they belonged to the megatherium or megalonyx, but as they are found with other bones of the former, they probably belong to that animal.

No. 17.* A large ungual phalanx, presented to Dr. Habersham, by Mr. Williams. The point is broken off, the bony part is well preserved. The horny covering is wanting.

Present length of the bone	10½ inches
Restored length	11 do.
Depth	4½ do.

There is in the cabinet of Mr. Williams the fragment of another claw, being the anterior extremity. [This claw belonged to the third toe of the right hind foot. W. B. H.]

No. 18. A clavicle of the megatherium, the humeral extremity broken off.

Present length	10½ inches
Diameter	3½ do.

No. 19.† The astragalus.

Circumference	26¾ inches
Diameter across articulating surface	10¼ inches

* Vide plate II., No. 1 and 2. † Vide plate.

Transverse, through arterial groove and tuber $9\frac{1}{2}$ inches

Weight 6lbs 14oz

B. ELEPHAS PRIMIGENIUS.

Two teeth.

C. EQUUS.

A tooth of a horse, well preserved, excepting the lower point.

Length	$2\frac{3}{4}$ inches
Greatest diameter	$1\frac{9}{10}$ do.
Least do.	1

D. BOS FAMILY.

A well defined portion of the humerus of a bos.

Diameter across the condyles	$4\frac{1}{2}$ inches
Diameter at the neck	$2\frac{8}{10}$ inches
Least do.	$2\frac{5}{10}$ do.

E. CHELONIA ORDER.

Several fragments of the carapace of a chelonia, perfectly fossilized. The lateral and marginal plates are small; the latter about one inch by $\frac{3}{4}$ of an inch in diameter. The size and form of the plates would indicate that they belonged to an animal probably of the Emys genus, having a shell from 10 to 12 inches in length.

F. FOSSIL MARINE SHELLS.

1. Cardium ventricosum.
2. Venus mercinaria.
3. Lutraria canaliculata.
4. Lutraria lineata.
5. Tellina divaricata.
6. Pyrula carica.

7. Pyrula canaliculata.
8. Oliva litterata.
9. Natica duplicata.
10. Ligaretus perspectivus.
11. Solecurtus carabeus.
12. Mactra similis.
13. Lucina divaricata.
14. Ranella caudata.

NOTE.—Mr. Owen, in his profound treatise on the *mylodon robustus*, says that, "the astragalus forms the most characteristic single bone in the skeleton of megatherioid quadrupeds. By the astragalus alone, not only might the existence of a megatherioid animal be inferred, but also, the particular genus to which it belonged could be determined." The astragalus is proportioned to the tibia on which it articulates, and is nine inches broad and nine high, according to Mr. Owen's comparative table. The breadth of Dr. Habersham's bone is 10¼ inches. The bony core of the great claw measures 11½ inches, restored, or 10½ as it now exists; whilst the same claw of the anterior extremity, in Mr. Owen's table, measures 10 inches. The dimensions of this bone present the following comparison, among megatherioids.

Mylodon	4 inches 10 lines
Megalonyx	6 do. 6 do.
Megatherium	10 do.

OBSERVATIONS,

ON THE GEOLOGY OF A PART OF THE SEA-COAST OF THE STATE OF GEORGIA; WITH A DESCRIPTION OF THE FOSSIL REMAINS OF THE MEGATHERIUM, MASTODON AND OTHER CONTEMPORANEOUS MAMMALIA AND FOSSIL MARINE SHELLS, FOUND IN THE BRUNSWICK CANAL AND AT SKIDDAWAY ISLAND, BY J. HAMILTON COUPER.

THE small portion of the sea-board of Georgia, the geological features of which it is pertinent to the object of this communication to describe, is that which lies between the Alatamaha and Turtle rivers, in the one direction, and the Atlantic ocean and a comparatively elevated plain, about twenty miles in the interior, known as the Sand Hills, in the other.

The whole of this district consists of a **Newer Pliocene*, overlaid in part, in its shallow vallies, by a *clay alluvium* of three distinct formations.

Commencing at the ocean, two small islands of a

* This term is not used in the restricted sense of Lyell, but in its older and more popular acceptation.

light, sandy soil, form the sea barrier. They are elevated a few feet only above the high spring tides, and the occurrence on them of fossil, marine shells, of existing species, shows, that they are of a newer pliocene formation. Within these islands, at a distance of from one to two miles, and separated from them by creeks and salt water marshes, lies the more important island of St. Simon's, which is several feet more elevated, but is of the same formation. To the west of this island, another body of salt marsh, intersected by creeks, occupies the space of three or four miles, between it and the continent. The latter, rising gradually from the level of the salt marsh, which is that of the ordinary high water, attains to a general height of between 10 and 20 feet; and in some spots to 40 feet. Near the head of tide water, the soil, which to that point is of a light, sandy character, changes to a compact, clay loam, of a very level surface, which is depressed several feet below the general height of the land lying to the east of it. This formation continues for several miles, and terminates at the eastern edge of the elevated plain of the Sand Hills. As it abounds in fossil remains of the Ostrea Virginica, it was probably, at one time, a salt water estuary.

At the eastern edge of the Sand Hills plain, the land rises by an abrupt step, to the height of 70 feet above spring tides, at which elevation it runs back, about 20 miles, when another similar step, of about the same height, occurs.

These two plains consist of a light, siliceous soil, resting generally on beds of clay, and exhibit slight traces of diluvial action, in their beds of a coarse sili-

ceous gravel, but no fossil remains have been found in them.

The alluvium consists, as has been observed, of three well defined formations;—the salt marsh, tide swamp, and inland swamp.

The most recent in point of age, but the most important in extent, is the *salt marsh.* This extensive body of low, flat, inundated land, forms a striking feature of the southern coast, and with a net work of salt water creeks, occupies the space between the sea islands and the continent, and the estuaries of the rivers, as far up as the ocean water flows. It is overflowed, at ordinary spring tides, to the depth of about a foot, and although covered with a dense growth of coarse grass, it is destitute of trees of any kind. It consists of a fine, tenacious, blue clay; mixed with highly comminuted sand, and vegetable and soft animal remains. This character of soil, diminishing in the amount of vegetable matter, and gradually becoming more compact, extends down to the depth of 10 or 12 feet, to a sandy, newer, pliocene formation, on which it rests. Occasionally an older alluvial formation occurs in the salt marsh, sometimes rising above it, but generally underlying it at the depth of two or three feet. It is in every respect identical with the inland swamp formation, which will be described hereafter, but is deserving of particular notice, in connection with the salt marsh, from the circumstance that stumps and roots of cypress and other fresh water trees, in the position of their growth, are found in this older formation, at the depth of from two to four feet below the ordinary height of the tides,

covered to that depth with the more recent alluvium of the salt marh.*

The occurrence of these remains, several miles from any growing trees, the depth at which they are found, and the formation on which they stand, all indicate a subsidence of the land. And as the trees, at this small depth, may still very readily be identified by their bark and fibre, this event is probably not of a very remote antiquity. The overflow, by the salt water, of lands which these vegetable remains prove to have been once covered by a fresh water growth, also indicates an encroachment of the ocean on this coast.

No fossil remains, that I am aware of, have been found in the newer formation of the salt marsh. But as will be shown hereafter, they occur in the associated, older, inland swamp.

The depth of the salt marsh alluvium is believed not generally to exceed ten or twelve feet. And some interesting facts, ascertained during an experiment made by the late Pierce Butler, Esq., in the year 1804, to obtain fresh water, by boring, in a salt marsh plantation, midway between St. Simon's Island and the continent, show that this alluvium rests, at about that depth, on a newer pliocene formation.†

* Bartram, in his travels through Georgia and South Carolina, in 1774, notices the occurence of trees below the surface of the marsh, at page 67.

† In this experiment, the borer, for the first eleven feet, brought up only black mud and clay, without any grit. At that depth coarse sand occurred. At twenty feet, wood, and with coarse sand, were brought up. After passing through alternate strata of clay

The *tide swamp* alluvium occupies that portion of the valley of the Alatamaha river, which lies above the line of brackish water. In surface it is only a few inches more elevated than the salt marsh, and is covered with a large and dense growth of fresh water trees. It does not differ very essentially, in the constitution of the soil, from the salt marsh; the principal difference arising from the circumstance that the one has been formed from the precipitation of the sediment suspended in salt, and the other from that of fresh water. Like the salt marsh it is a recent alluvium, still in the course of formation, and like it is associated with the older inland swamp formation, which sometimes underlies it and sometimes rises a few feet above it, in small knolls. Throughout the tide swamp formation, at the depth of 2 or 3 feet, are found the remains of large cypress and other trees, *in situ*, over which similar trees of the largest size are now growing. As the tide flows, at its ordinary height, nearly to the top of these swamps, and during spring tides above them, this change in the ancient level of the surface cannot be explained, as in the vallies of the Po and the Mississippi, by the simultaneous rise in both the bed and banks of the rivers, but must be regarded as a further proof of not a very

and coarse sand, shells and wood were again met with, at the depth of thirty-six feet. At forty-one and a half feet compact limestone, oyster shells, conch and clam shells, with brown sand, clay and pebbles, were found. At fifty feet, limestone again, and at fifty-six and sixty-three feet, the shells had become more abundant.

An experiment, made by Mr. Ramsay, in a salt marsh at Charleston, for the same purpose, gave results nearly identical with the above.

remote subsidence of the land. No fossil remains have been found in the recent tide-land formation.

The third and oldest formation of alluvium, is the *inland swamp.* This formation, although found associated with the salt marsh and tide swamp, is obviously of a date much anterior to either. Its geological position is between the newer marine pliocene and the recent alluvium of the historical period. As the depository of all of the fossil land mammalia which have been discovered on the coast of Georgia, it possesses a peculiar interest, not only as connected with the subject of this communication, but as throwing a very important light on the question of the period of the existence of the megatherium, mammoth, mastodon, and the other extinct mammalia, which have been found associated with them.

This formation occurs extensively in the district of country under consideration, and is found with its surface varying from several feet below high water, to fifteen feet above it. It usually, however, occurs, rising a few feet above tide water, and slightly depressed below the level of the surrounding newer pliocene, sandy lands. It appears, in most places, to have been the first quiet, alluminous deposit, after the upheaving of the coast from the bed of the ocean, and occupies the shallow vallies of the newer pliocene. This formation consists, usually, of a surface stratum of loam, one or two feet deep, resting on a compact clay, destitute of vegetable matter. The stratum of clay varies in depth, but is generally from 5 to 10 feet deep, and is of various colors, but is more commonly blue or yellow. It frequently contains beds of marl, calcareous and siliceous gravel,

petrified wood, bog iron ore, and in most instances exhibits traces of lime and iron. In some localities it assumes the appearance of green marl, and contains grains of proto-phosphate of iron. It rests, in every instance, at a greater or less depth, on a sandy, newer, pliocene formation. No fossil shells have hitherto been noticed in it; but, as has been observed, all the fossil bones of the terrestrial mammalia, discovered on the sea-coast of Georgia, have been found at the *bottom* of it, and *embedded* in it, but resting *on* the newer, pliocene sand.

With these preliminary remarks on the general geological features of this district—and which apply to the whole coast of Georgia—I now proceed to a more detailed descripton of the three deposits of the Brunswick Canal, Skiddaway Island and Heyner's Bridge, to which points the discovery of fossil bones have hitherto been confined.

The Brunswick Canal, from which the fossil, terrestrial and marine bones and fossil marine shells, were taken, during the years 1838 and 1839, is intended, when finished, to connect the Alatamaha and Turtle rivers. It lies about nine miles from the ocean, and two from the eastern edge of the mainland, to which its general course is parallel; and is excavated, in part, through the sandy, newer, pliocene which forms this part of the continent, and in part, through a narrow inland swamp, called the six-mile. This swamp is connected, by creeks, with the Alatamaha and Turtle rivers, at its opposite ends, and at either extremity, the sandy land closes in between the swamp and the rivers, and leaves only small,

shallow channels for the discharge of its waters. It presents, therefore, the appearance of a small, shallow lake, which has been gradually filled up by alluvial deposits, to within a few feet of the surrounding, sandy plain. This alluvium consists of a hard, compact clay, generally of a yellow color, much impregnated with iron, and contains thin strata of a soft, chalky marl, and numerous fragments of calcareous petrifactions of wood.* It is covered by a thin stratum of vegetable and sandy loam, and rests, at an average depth of five or six feet, on a yellow sand, varying in coarseness, but always of well rounded grains. The surface of the swamp is about eleven feet at its ends, and sixteen in the centre, above the line of high water at spring tides, and forms an inclined plane, sloping off to the two rivers.

The fossil bones of the terrestrial mammalia, (see list,) were discovered, during the excavation of the canal, at the southern end of the swamp, at six different points, extending up it, from its junction with the salt marsh, to a distance of three miles. In every instance they were found at the bottom of the alluvial formation, between four and six feet below the surface, embedded in clay, but resting on yellow sand. This yellow sand stratum is, at these points, about five feet above the line of spring tides. Five feet below its surface, or at the height of high water, it changes from a yellow to a white color, and assumes a quicksand character, which it retains for one or two feet. It is then succeeded by a coarser and

* These petrifactions are of recent origin, as is proved by specimens containing a portion of woody fibre and bark.

sharper sand, with occasional thin strata of a fœtid, black mud. Marine fossil shells, (see list,) of the same species as those now existing along the adjoining coast, are found in small masses, in a slightly inclined or horizontal position, scattered at intervals, throughout the whole length of the canal, and at depths extending from the surface of the sand to five feet below the line of high water—which is the greatest depth to which the excavation has extended.

The same species, particularly the mactra lateralis, are generally found grouped together; and as several of them, such as the artemis concentrica, and tellina alternata, are so perfect as still to retain their epidermis, it is obvious that they originally grow on or near to the spot in which they are now found.

Besides the fossil shells, the rib and two vertebræ of a whale, and an os femoris of an extinct chelonia,* were found imbedded in the sandy substratum, at the northern extremity of the canal, and in the same substratum, but at the opposite end, fragments of the carapace and sternum of two small species of chelonia, probably of the genus emys, were discovered.

The bones of the different species of mammalia occured together, in groups, and in some cases the greater part of the bones of the same skeleton were found in immediate juxta-position. They were generally unbroken, when first uncovered, but being soft and tender, fell to pieces if roughly handled. Many of the specimens were quite perfect, and beautifully

* *Chelonia Couperii* of Harlan.—Silliman's Journal Vol. 43, in which volume is also a description of the maxillary bone of the *Sus Americana*, found also in this canal.

fossilized, and in no instance, except when they had been washed out into a salt water creek, was there any abrasion of the surface, or incrustation of marine shells. These circumstances render it highly probable that the carcases of the various animals were floated, or fell, into the then lake or stream, and sinking to the sandy bottom, were gradually covered to their present depth by the alluvial deposit from the water. All the bones of the terrestrial mammalia were found at nearly the same depth below the surface, resting on the same stratum of sand, and embedded in the same alluvial formation.

THE SKIDDAWAY ISLAND DEPOSITS.

The Island of Skiddaway consists of a sandy, newer, pliocene formation, rising but a few feet above high tide; and is surrounded, on all sides, by salt water creeks or a salt-marsh. The islands of Great Warsaw and Green are interposed between it and the ocean, and its western edge is washed by Skiddaway river, which with a body of salt marsh, separates it from the continent.

The two deposits of fossils occur in the inner or western edge of the island, at points when the river, impinging against it, has undermined the banks. They are near the southern end of the island, about two miles from Vernon river. Entering into the Skiddaway river from that stream, for half a mile, the low sandy point of the island is separated from the river by a newer salt-marsh, of recent formation. The river then washes, for a short distance, an inland

swamp formation, which runs up a few yards into the island. Passing along the sandy bluff of Mr. Myers' plantation, it again meets with another small body of an inland swamp formation, which lies in between the two sandy bluffs of Messrs. Myers' and Stark's plantations, and extends, in the form of a half moon, for a short distance into the island. About midway along this strip of alluvium, at and below the line of low water, the recent discovery of fossils was made by the late Major E. Williams. The river then again strikes the sandy bluff of the island, at Stark's, and continues to wash it to Major Williams' plantation, a distance of about half a mile. Between these two points the original deposit, for a knowledge of which the scientific world is indebted to Mr. J. C. Habersham, of Savannah, was discovered.*

At both of these points designated above, the fossil bones were found at the edge of the river bank, about the line of very low water, and appear to have been washed out from the lower part of the inland swamp formation, which here rises somewhat above high water, and rests, at the line of low water, at neap tides, on a newer, pliocene sand. A portion of these bones have been swept into the channel of the river, and of these some have been much worn and are covered with marine shells, while others, which have more recently been disinterred, are perfect and very beautifully fossilized.

A reference to the appendix list of the fossil bones

* See Dr. Mitchell's and Mr. Wm. Cooper's description of these fossils, in the annals of the Lyceum of Natural History of New York, for 1824.

of the mammallia, discovered by the late Major Williams, between Messrs. Myers' and Stark's, will show that the elephas primigenius, the mastodon giganteum, the megatherium cuvieri, a species of bos, and another of equus, were found associated here, as well as in the Brunswick canal deposit. It appears also that they were imbedded in, and rested in similar formations. On an examination of the list of the shells and other fossils, found in newer, pliocene substratum, it will also be found that the same shells occur in the two localities, and that in both are found fragments of the carapace and sternum of small species of the chelonia order, most probably of the young emys. With the exception, therefore, of a difference in the height of the two deposits, they correspond in all essential features.

HEYNER'S* BRIDGE DEPOSIT.

This locality lies a few miles to the north-west of the Skiddaway Island deposit. Vernon creek, which takes its rise near Savannah, runs through the sandy plain forming the main land, nearly parallel to the Skiddaway river; and at a very short distance from it. Small bodies of salt-marsh skirt it as high up as Heyner's Bridge, at which point the alluvial deposit assumes the character of the inland swamp formation, and it is at this point, when the current of the creek has undermined it, that the fossil bones have been discovered, lying in the channel, at the line

* Or Hainer's.

of low water. The bones taken from this deposit have not been described, but those which I have examined all belong to the mastodon. As the formation of this deposit presents no new features it is only necessary to say that it corresponds, in all the important particulars, with that of the Brunswick canal and Skiddaway deposits.

GENERAL REMARKS.

The features which characterize the three deposits, above described, being well defined, and in all essential particulars identical, we may be permitted, from this and the other facts, mentioned above, to venture on the following generalizations.

1st. That the elephas primigenius, mastodon giganteum, megatherium cuvieri, sui americana, (Harlan,) with extinct species of the hippopotamus, equus and bos were contemporaneous.

2d. That these mammalia existed at a period posterior to the elevation from the ocean of a well characterized, newer, pliocene formation.

3d. That they existed immediately before, or about the time of the commencement of the formation of the inland swamp alluvium.

4th. That as there are no appearances of diluvial action in the adjoining country, or in the alluvium enveloping the bones, no attrition of their surface, and as they occur at the bottom of the alluvium, and not scattered through it, with the bones of some skeletons in juxta position, the mammalia to which they belonged do not appear to have perished by any violent or sudden catastrophe.

5th. That the occurrence, in situ, of the stumps of trees, of a fresh water growth,* in the salt-marsh, from two to four feet below high water, proves that the land has sunk several feet, at a period comparatively recent.

6th. That the similarity of the fossil shells, found in the newer pliocene, underlying the fossil bones, with the existing species of the adjoining coast, shows that if a change of temperature sufficient to destroy the extinct gigantic mammalia, has occurred, there has been none since long prior to the historical period adequate to change, materially, the species of the marine mollusca of this coast.

7th. That the sea-coast of Georgia presents a well characterized, newer, pliocene formation, and that we are enabled to extend this formation from St. Mary's county, in Maryland, and Newbern, in North Carolina, where it was first noticed by Mr. Conrad, to the southern limit of Georgia.

FOSSILS FOUND IN THE BRUNSWICK AND ALATAMAHA CANAL, DURING THE YEARS 1838 AND 1839.†

A. TERRESTRIAL MAMMALIA FROM THE BOTTOM OF THE INLAND SWAMP FORMATION.

1. Of the *megatherium.*

The two superior maxillaries, showing the sockets of the teeth.

* Cypressus disticha, Juniperus Virginiana and Pinus.

† The most important of these fossils, are now in the Cabinet of the Academy of Natural Sciences of Philadelphia.

A lower maxillary bone, with the four teeth, in situ.

Six heads of the femur.

A portion of do.

A part of the ilium, with the glenoid cavity.

Several dorsal vertebræ.

Several teeth.

2. Of the *elephas primigenius.*

The two lower maxillary bones, with the teeth, in situ.

Two rotula of do.

Several detached teeth.

Two tusks.

Several vertebræ.

3. Of the *mastodon giganteum.*

Several teeth, with the crowns very perfect.

4. Of the *hippopotamus.*

A lower incisor tooth.

5. Of the *horse.*

One molar tooth.

6. Of the *bos.*

A tibia.

A humerus.

7. Of the *hog.* (*Sus Americana* of Harlan.)

The left lower maxillary, with four molar teeth and the socket of the fifth.

8. Several ribs and fragments of a small animal, too imperfect to be identified.

B. FOSSILS FROM THE NEWER PLIOCENE SAND, UNDERLYING THE STRATUM OF CLAY CONTAINING THE ABOVE FOSSILS.

1. A rib and two vertebræ of a *whale.*

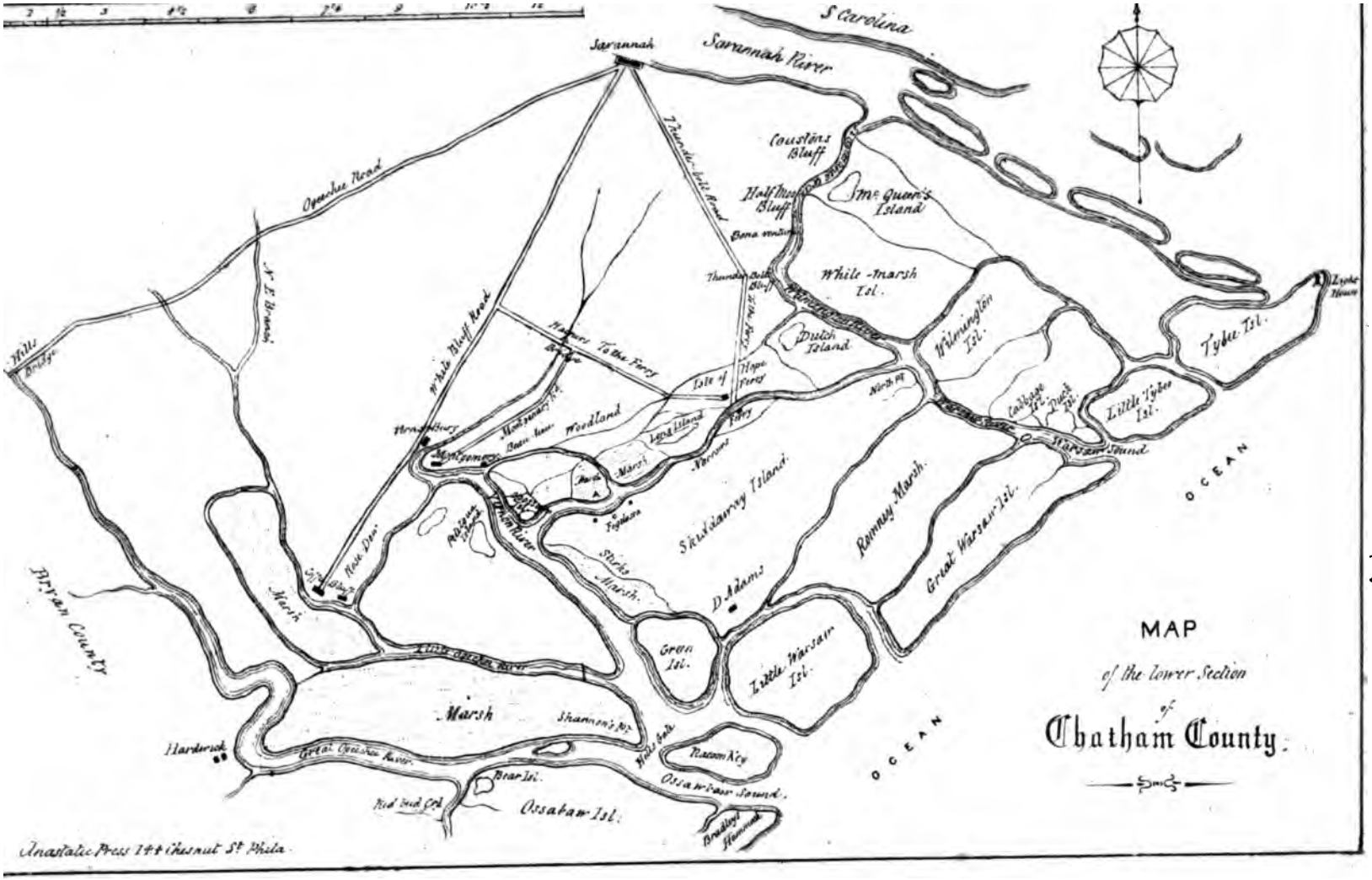
2. A right os femoris of an extinct chelonia. (*Chelonia Couperii* of Harlan.)

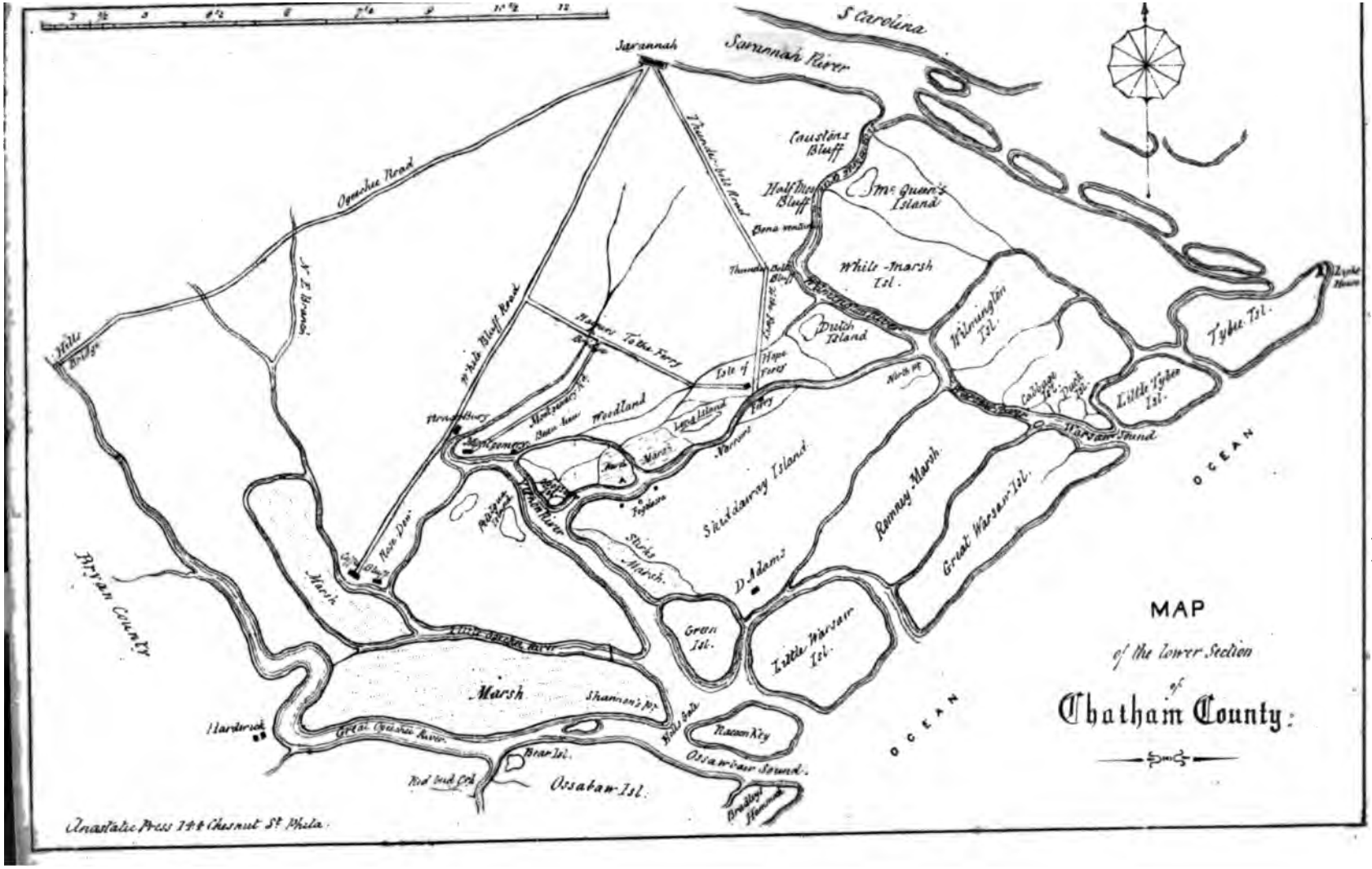
3. Fragments of the carapace and sturnum of *two species* of *chelonia*, probably of the genus *Emys.* These fragments belong to animals from 8 to 10 inches long.

4. The following *marine shells.*

Pyrula carica.
Pyrula canaliculata.
Venus mercinaria.
Artemis concentrica.
Cardium ventricosum.
Arca penderosa.
Arca incongrua.
Arca transversa.
Venus elevata.
Arca pexata.
Lucina devaricata.
Mactra similis.
Mactra oblonga.
Mactra lateralis.
Tellina alternata.
Lutraria canaliculata.

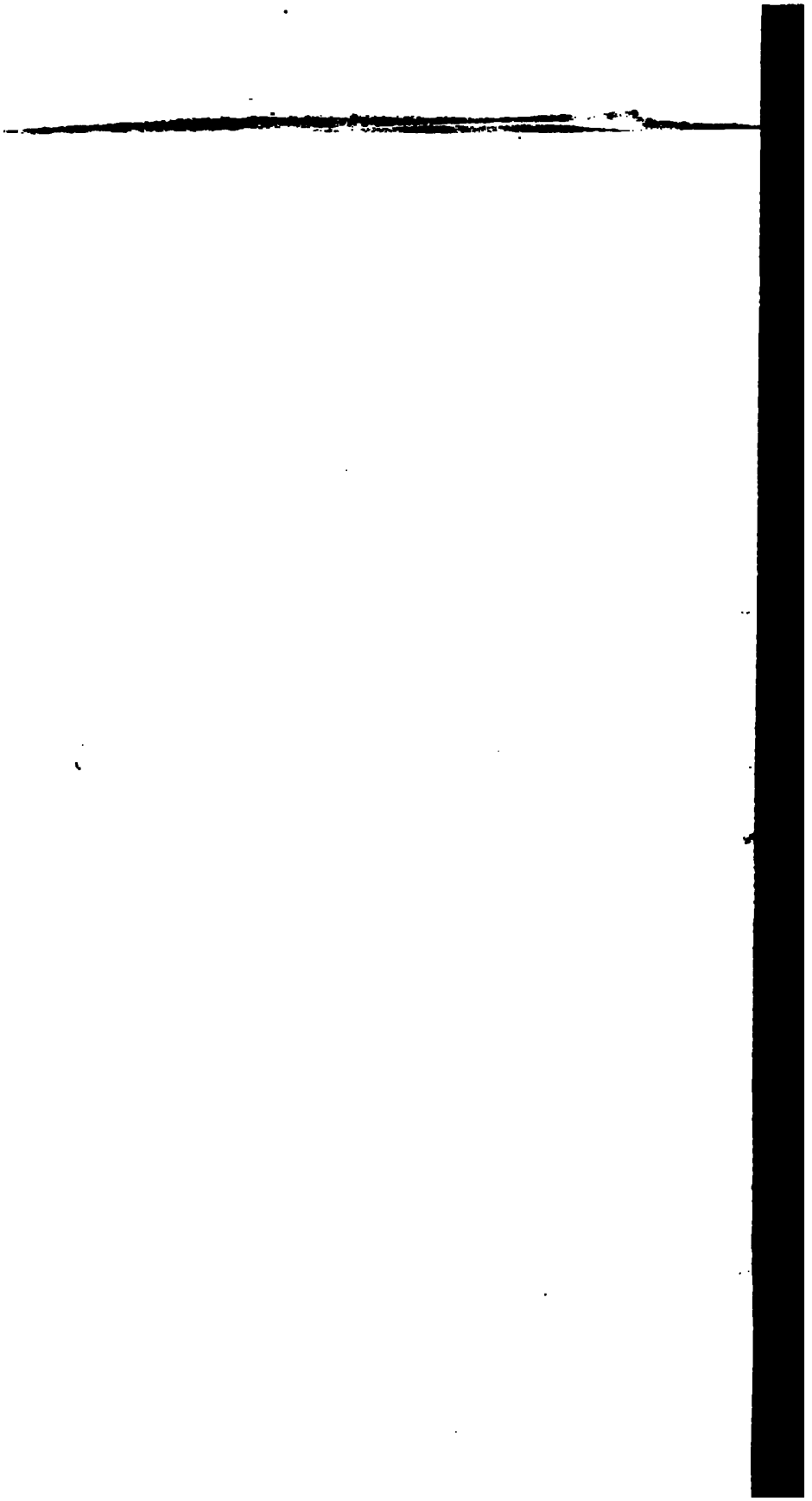
Solen ensis.
Solecurtus caribæus.
Pholas certata.
Petricola pholadiformis.
Ostrea virginica.
Oliva litterata.
Oliva mutica.
Cerithium dislocatum.
Cryptostema perspectivus.
Cupidula glauca.
Cupidula convexa.
Columbella avara.
Natica duplicata.
Buccinum obsoletum.
Anomia electrica.
Scutella quinquefora.


S Carolina
Savannah
Savannah River
Coustons Bluff
Half Moon Bluff
Mc Queen's Island
White-marsh Isl.
Dutch Island
Wilmington Isl.
Tybee Isl.
Little Tybee Isl.
Lighthouse
Ogeechee Road
White Bluff Road
Thunderbolt Road
Isle of Hope
Woodland
Skidaway Island
Romney Marsh
Great Warsaw Isl.
Little Warsaw Isl.
Green Isl.
D. Adams
Marsh
Shannon's Pt.
Hardwick
Great Ogeechee River
Bear Isl.
Ossabaw Isl.
Ossabaw Sound
Wassaw Sound
OCEAN
OCEAN
Bryan County
MAP
of the lower Section
of
Chatham County.
Anastatic Press 144 Chesnut St Phila.


Savannah
Savannah River
S Carolina
Causton's Bluff
Half Moon Bluff
Mc Queen's Island
White-Marsh Isl.
Wilmington Isl.
Tybee Isl.
Little Tybee Isl.
Ogeechee Road
Thunderbolt Road
Isle of Hope
Skidaway Island
Romney Marsh
Great Warsaw Isl.
Little Warsaw Isl.
Green Isl.
D. Adams
Marsh
Shannon's Pt.
Hardwick
Great Ogeechee River
Bear Isl.
Ossabaw Isl.
Ossabaw Sound
Bryan County
OCEAN
MAP
of the Lower Section
of
Chatham County:
Anastatic Press 744 Chesnut St Phila.

Drawn from nature by P. Stanton.

Fig. 1. Outside view of the upper frontal portion of the Skull
" 2 Inside view of the same.
" 3 Upper view of the distal or ungual phalanx.
" 4 Under view of the same.
" 5. Upper view of the Astragalus.
" 6 Under view of the same.



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